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**Lincoln Laboratory**  
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OF

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VOLUME 21

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FOR THE COMMANDER



Gary Tutungian  
Administrative Contracting Officer  
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## **FOREWORD**

Volume 21 of Unclassified Publications of Lincoln Laboratory lists reports published from 1 January to 31 December 1995, as well as updated information on earlier publications.

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## **MISCELLANEOUS PROGRESS REPORTS**

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1006	Progress Report on the Development of the Automatic Target Recognition System for the UGV/RSTA LADAR	Verly, J.G. Dudgeon, D.E. Lacoss, R.T.	21 Mar. 1995	ADA294090
1008	Physical Optics Polarization Scattering Matrix for a Right-Angle Dihedral	Verly, J.G.	7 Feb. 1995	ADA293036
1009	Graphical Analysis of Hidden Markov Model Speech Recognition Experiments	Seward, D.C. IV Zissman, M.A.	25 Oct. 1995	ADA300991
1010	Language Identification Through Parallel Phone Recognition	Chou, C.S. Zissman, M.A.	19 May 1995	ADA295381
1017	Machine Learning for a Toolkit for Image Mining	Delanoy, R.L. Sasiela, R.J.	6 Mar. 1995	ADA293137
1018	Infrared Detections of Satellites with IRAS	Gaposchkin, E.M. Bergemann, R.J.	26 Sep. 1995	
1019	Bragg Resonance in Measured L-Band Radar Clutter Doppler Spectra from Inland Water	Billingsley, J.B. Larrabee, J.F.	1 Aug. 1995	ADA297680
1020	A Satellite Anomaly Detection System that Uses Signatures from the Space-Surveillance Network of Sensors	Raup, R.C. Stuart, J.S. Curtis, J.W.	7 Sep. 1995	ADA298814
1021	A Strategy for Higher Temperature Superconductivity in the Layered Cuprates	Dionne, G.F.	10 July 1995	ADA296885

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1023	A Combat Identification Model for Netted Theater Air Defense Systems	Weiner, S.D. Cebula, D.P.	27 Nov. 1995	ADA301812
1024	Temperature Dependence of Large Polaron Superconductivity	Dionne, G.F.	18 July 1995	ADA296885

## JOURNAL ARTICLES

### JA No.

6800	Adaptive Array CFAR Detection	Kalson, S.Z.	IEEE Trans. Aerosp. Electron. Syst., Vol. 31, No. 2, April 1995, pp. 534–542
6853	Laser Physics	Kelley, P.L. Zayhowski, J.J.	Chapter in <i>Encyclopedia of Applied Physics</i> , Vol. 8, 1994, pp. 299–320
6920	Spatial-Temporal Detection of Electro-Optic Moving Targets	Pohlig, S.C.	IEEE Trans. Aerosp. Electron. Syst., Vol. 31, No. 2, April 1995, pp. 608–616
6926	LTPSK: Simple, Bandwidth Efficient Modulation for Multi-Rate Satellite Channels	McGuffin, B.F. Rhodes, R.R.	IEEE Trans. Commun., Vol. 43, No. 2/3/4, February/March/April 1995, pp. 386–395
6964	Integrated AlGaAs Waveguide Components for Optical Phase Difference Measurement and Correction	Lau, S.D. Donnelly, J.P. Wang, C.A. Rediker, R.H.	IEEE J. Quantum Electron., Vol. 30, No. 6, June 1994, pp. 1417–1426
6987	Robust Text-Independent Speaker Identification Using Gaussian Mixture Speaker Models	Reynolds, D.A. Rose, R.C.	IEEE Trans. Speech Audio Process., Vol. 3, No. 1, January 1995, pp. 72–83
7031	Atmospheric-Compensation Experiments in Strong-Scintillation Conditions	Primmerman, C.A. Price, T.R. Humphreys, R.A. Zollars, B.G. Barclay, H.T. Herrmann, J.	Appl. Opt., Vol. 34, No. 12, 20 April 1995, pp. 2081–2088

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7033	Measurement and Model for Correlating Phase and Baseband 1/f Noise in an FET	Martinez, R.D. Oates, D.E. Compton, R.C.	IEEE Trans. Microw. Theory Tech., Vol. 42, No. 11, November 1994, pp. 2051–2055
7036A	Efficient Computation of the Circular Error Probability (CEP) Integral	Shnidman, D.A.	IEEE Trans. Autom. Control, Vol. 40, No. 8, August 1995, pp. 1472–1474
7048	<i>Q</i> -Switched Operation of Quasi-Three-Level Lasers	Nabors, C.D.	IEEE J. Quantum Electron., Vol. 30, No. 12, December 1994, pp. 2896–2901
7050	Mosaic Diamond Substrates Approaching Single-Crystal Quality Using Cube-Shaped Diamond Seeds	Geis, M.W. Efremow, N., Jr. Susalka, R. Twichell, J.C. Snail, K.A. Spiro, C. Sweeting, B. Holly, S.	Diamond Related Mater., Vol. 4, No. 1, December 1994, pp. 76–82
7063	A New Face-Centered-Cubic Photonic Crystal for Microwave and Millimeter-Wave Applications	Brown, E.R. Agi, K.N. Dill, C. III Parker, C.D. Malloy, K.J.	Microw. Opt. Technol. Lett., Vol. 7, No. 17, 5 December 1994, pp. 777–779
7066	High-Density Laser Linking of Metal Interconnect	Bernstein, J.B. Ventura, T.M. Radomski, A.T.	IEEE Trans. Compon. Packag. Manuf. Technol. A, Vol. 17, No. 4, December 1994, pp. 590–593
7074	A Single Barrier Varactor Quintupler at 170 GHz	Räisänen, A.V. Tolmunen, T.J. Natzic, M. Frerking, M.A. Brown, E.R. Grönqvist, H. Nilsen, S.M.	IEEE Trans. Microw. Theory Tech., Vol. 43, No. 3, March 1995, pp. 685–688

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7085	Experimental Investigations of Crack Trapping in Brittle Heterogeneous Solids	Mower, T.M. Argon, A.S.	Mech. Mater., Vol. 19, 1995, pp. 343–364 ADA294720
7089	A Self-Organizational Approach for Resolving Air Traffic Conflicts	Eby, M.S.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 239–254
7090	100-GHz Soliton Pulse Train Generation Using Soliton Compression of Two Phase Side Bands from a Single DFB Laser	Swanson, E.A. Chinn, S.R. Hall, K.L. Rauschenbach, K.A. Bondurant, R.S. Miller, J.W.	IEEE Photonics Technol. Lett., Vol. 6, No. 10, October 1994, pp. 1194–1196
7093	An Orthogonal-Transfer CCD Imager	Burke, B.E. Reich, R.K. Savoye, E.D. Tonry, J.L.	IEEE Trans. Electron Devices, Vol. 41, No. 12, December 1994, pp. 2482–2484
7094	Large Population Speaker Identification Using Clean and Telephone Speech	Reynolds, D.A.	IEEE Signal Process. Lett., Vol. 2, No. 3, March 1995, pp. 46–48
7101	Machine Intelligence for ATC Equipment Maintenance	Heggestad, H.M.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 255–270
7104	Linearized Modulator for Suboctave-Bandpass Optical Analog Links	Betts, G.E.	IEEE Trans. Microw. Theory Tech., Vol. 42, No. 12, December 1994, pp. 2642–2649
7107	Characteristics of the Quasi-Optical Reflection Circulator	Harris, N.W. Dionne, G.F. Weiss, J.A. Lax, B.	IEEE Trans. Magn., Vol. 30, No. 6, November 1994, pp. 4521–4523

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7110	Tm:YVO <sub>4</sub> Microchip Laser	Zayhowski, J.J. Harrison, J. Dill, C. III Ochoa, J.R.	Appl. Opt., Vol. 34, No. 3, 20 January 1995, pp. 435–437
7112	GPS-Squitter: System Concept, Performance, and Development Program	Orlando, V.A. Knittel, G.H. Boisvert, R.E.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 271–294
7115	Laser Vibration Sensing	Kachelmyer, A.L. Schultz, K.I.	Linc. Lab. J., Vol. 8, No. 1, Spring/Summer 1995, pp. 3–28
7116	Optical Coherence Tomography of the Human Retina	Hee, M.R. Izatt, J.A. Swanson, E.A. Huang, D. Schuman, J.S. Lin, C.P. Puliafito, C.A. Fujimoto, J.G.	Arch. Ophthalmol., Vol. 113, March 1995, pp. 325–332
7118	Optical Heterodyne Detection and Microwave Rectification up to 26 GHz Using Quantum Well Infrared Photodetectors	Liu, H.C. Jenkins, G.E. Brown, E.R. McIntosh, K.A. Nichols, K.B. Manfra, M.J.	IEEE Electron Device Lett., Vol. 16, No. 6, June 1995, pp. 253–255
7124	Uniform Linear Arrays of Strained-Layer InGaAs-AlGaAs Quantum-Well Ridge-Waveguide Diode Lasers Fabricated by ECR-IBAE	Woodhouse, J.D. Wang, C.A. Donnelly, J.P. Tsang, D.Z. Bailey, R.J. Mull, D.E. Rauschenbach, K.A. Popov, O.A.	IEEE J. Quantum Electron., Vol. 31, No. 8, August 1995, pp. 1357–1363
7127A	Stability and Timing Maintenance in Soliton Transmission and Storage Rings	Moores, J.D. Wong, W.S. Haus, H.A.	Opt. Commun., Vol. 113, Nos. 1–3, 15 December 1994, pp. 153–175

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7128	Radar Detection Probabilities and Their Calculation	Shnidman, D.A.	IEEE Trans. Aerosp. Electron. Syst., Vol. 31, No. 3, July 1995, pp. 928–950
7131	A Fiber Frequency Shifter with Broad Bandwidth, High Conversion Efficiency, Pump and Pump ASE Cancellation, and Rapid Tunability for WDM Optical Networks	Swanson, E.A. Moores, J.D.	IEEE Photonics Technol. Lett., Vol. 6, No. 11, November 1994, pp. 1341–1343
7133	Energy Onset Times for Speaker Identification	Quatieri, T.F. Jankowski, C.R., Jr. Reynolds, D.A.	IEEE Signal Process. Lett., Vol. 1, No. 11, November 1994, pp. 160–162
7139	Mode S Data-Link Applications for General Aviation	Bussolari, S.R.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 313–328
7145A	Effects of Polarization and Resolution on the Performance of a SAR Automatic Target Recognition System	Novak, L.M. Halversen, S.D. Owirka, G.J. Hiett, M.	Linc. Lab. J., Vol., 8, No. 1, Spring/Summer 1995, pp. 49–68
7146	Strained-Layer InGaAsP Diode Lasers with Tapered Gain Region for Operation at $\lambda = 1.3 \mu\text{m}$	Groves, S.H. Donnelly, J.P. Walpole, J.N. Woodhouse, J.D. Missaggia, L.J. Bailey, R.J. Napoleone, A.	IEEE Photonics Technol. Lett., Vol. 6, No. 11, November 1994, pp. 1286–1288
7151	A New Three-Terminal Switching Device	Cohen, S.S. Raffel, J.I. Knecht, J.M.	IEEE Electron Device Lett., Vol. 16, No. 3, March 1995, pp. 115–117

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7152	The Three-Terminal Fuse: A New Switching Device	Cohen, S.S.	IEEE Trans. Electron Devices, Vol. 42, No. 7, July 1995, pp. 1352–1355
7154	Photomixing up to 3.8 THz in Low-Temperature-Grown GaAs	Brown, E.R. McIntosh, K.A. Nichols, K.B. Dennis, C.L.	Appl. Phys. Lett., Vol. 66, No. 3, 16 January 1995, pp. 285–287
7155	CH <sub>3</sub> I Vapor Etching of Masked and Patterned GaAs	Krueger, C.W. Wang, C.A. Hsieh, D. Flytzani-Stephanopoulos, M.	J. Cryst. Growth, Vol. 153, Nos. 3/4, 11 August 1995, pp. 81–89
7157	A Comparison of Signal Processing Front Ends for Automatic Word Recognition	Jankowski, C.R., Jr. Vo, H-D.H. Lippmann, R.P.	IEEE Trans. Speech Audio Process., Vol. 3, No. 4, July 1995, pp. 286–293
7159	40-GHz Pulse Train Generation Using Soliton Compression of a Mach-Zehnder Modulator Output	Swanson, E.A. Chinn, S.R.	IEEE Photonics Technol. Lett., Vol. 7, No. 1, January 1995, pp. 114–116
7160	The Integrated Terminal Weather System Terminal Winds Product	Cole, R.E. Wilson, F.W.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 475–502
7165	Electron Field Emission from Diamond and Other Carbon Materials after H <sub>2</sub> , O <sub>2</sub> , and Cs Treatment	Geis, M.W. Twichell, J.C. Macaulay, J. Okano, K.	Appl. Phys. Lett., Vol. 67, No. 9, 28 August 1995, pp. 1328–1330
7167	High-Power, High-Temperature Operation of GaInAsSb-AlGaAsSb Ridge-Waveguide Lasers Emitting at 1.9 $\mu$ m	Choi, H-K. Turner, G.W. Connors, M.K. Fox, S. Dauga, C. Dagenais, M.	IEEE Photonics Technol. Lett., Vol. 7, No. 3, March 1995, pp. 281–283

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7168	Design of Ultrawideband Photonic Crystals for Broadband Antenna Applications	Agi, K.N. Brown, E.R. McMahon, O.B. Dill, C. III Malloy, K.J.	Electron. Lett., Vol. 30, No. 25, 8 December 1994, pp. 2166–2167
7169	Basic Module for an Integrated Optical Phase Difference Measurement and Correction System	Golubovic, B. Donnelly, J.P. Wang, C.A. Goodhue, W.D. Rediker, R.H.	IEEE Photonics Technol. Lett., Vol. 7, No. 6, June 1995, pp. 649–651
7170	Toward Standard Figures-of-Merit for Spatial and Quasi-Optical Power-Combined Arrays	Gouker, M.	IEEE Trans. Microw. Theory Tech., Vol. 43, No. 7, July 1995, pp. 1614–1617
7171	Equivalence of Adaptive Array Diagonal Loading and Omnidirectional Jamming	Carlson, B.D.	IEEE Trans. Antennas Propag., Vol. 43, No. 5, May 1995, pp. 540–541
7174	Self-Aligned GaAs MISFET's with a Low-Temperature-Grown GaAs Gate Insulator	Chen, C-L. Mahoney, L.J. Nichols, K.B. Manfra, M.J. Gramstorff, B.F. Molvar, K.M. Murphy, R.A. Brown, E.R.	IEEE Electron Device Lett., Vol. 16, No. 5, May 1995, pp. 199–201
7175	Microwave Hysteretic Losses in $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ and NbN Thin Films	Nguyen, P.P. Oates, D.E. Dresselhaus, G. Dresselhaus, M.S. Anderson, A.C.	Phys. Rev. B, Condens. Matter, Vol. 51, No. 10, 1 March 1995, pp. 6686–6695

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7180	Direct Detection of Nucleic Acid Hybridization on the Surface of a Charge Coupled Device	Lamture, J.B. Beattie, K.L. Burke, B.E. Eggers, M.D. Ehrlich, D.J. Fowler, R. Hollis, M.A. Kosicki, B.B. Reich, R.K. Smith, S.R. Varma, R.S. Hogan, M.E.	Nucleic Acids Res., Vol. 22, No. 11, 1994, pp. 2121–2125
7183	High-Performance 770-nm AlGaAs-GaAsP Tensile-Strained Quantum-Well Laser Diodes	Agahi, F. Lau, K.M. Choi, H-K. Baliga, A. Anderson, N.G.	IEEE Photonics Technol. Lett., Vol. 7, No. 2, February 1995, pp. 140–143
7188	InAsSb/InAlAs Strained Quantum-Well Lasers Emitting at 4.5 $\mu$ m	Choi, H-K. Turner, G.W. Le, H.Q.	Appl. Phys. Lett., Vol. 66, No. 26, 26 June 1995, pp. 3543–3545
7189	A One-Watt, 10-Gbps High-Sensitivity Optical Communication System	Livas, J.C. Swanson, E.A. Chinn, S.R. Kintzer, E.S. Bondurant, R.S. DiGiovanni, D.J.	IEEE Photonics Technol. Lett., Vol. 7, No. 5, May 1995, pp. 579–581
7190	Coupled-Cavity Electro-Optically <i>Q</i> -Switched Nd:YVO <sub>4</sub> Microchip Lasers	Zayhowski, J.J. Dill, C. III	Opt. Lett., Vol. 20, No. 7, 1 April 1995, pp. 716–718
7194	Suppressed Gate Current in a Superlattice-Insulated-Gate Field-Effect Transistor on InP	Brown, E.R. Chen, C-L. Mahoney, L.J. Maki, P.A. Nichols, K.B.	Appl. Phys. Lett., Vol. 66, No. 18, 1 May 1995, pp. 2352–2354

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7195	TCAS: Maneuvering Aircraft in the Horizontal Plane	Burgess, D.W. Altman, S.I. Wood, M.L.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 295–312
7196	Supporting the Deployment of the Terminal Doppler Weather Radar (TDWR)	Evans, J.E. Bernella, D.M.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 379–398
7198	Automated Storm Tracking for Terminal Air Traffic Control	Chornoboy, E.S. Matlin, A.M. Morgan, J.P.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 427–448
7199	Automated Microburst Wind-Shear Prediction	Wolfson, M.M. Delanoy, R.L. Forman, B.E. Hallowell, R.G. Pawlak, M.L. Smith, P.D.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 399–426
7201	Laser-Formed Metallic Connections Employing a Lateral Link Structure	Bernstein, J.B. Colella, B.D.	IEEE Trans. Compon. Packag. Manuf. Technol. A, Vol. 18, No. 3, September 1995, pp. 690–692
7202	193-nm Lithography at MIT Lincoln Lab	Hibbs, M.S. Kunz, R.R. Rothschild, M.	Solid State Technol., Vol. 38, No. 7, July 1995, pp. 69–78
7203	The Integrated Terminal Weather System (ITWS)	Evans, J.E. Ducot, E.R.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 449–474
7204	Spectral Linewidth of a Free-Running Continuous Wave Single-Frequency External-Cavity Quantum-Well InGaAs/AlGaAs Diode Laser	Hsu, L. Mooradian, A. Aggarwal, R.L.	Opt. Lett., Vol. 20, No. 17, 1 September 1995, pp. 1788–1790

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7206	Ho:YAG Laser Pumped by 1.9- $\mu$ m Diode Lasers	Nabors, C.D. Ochoa, J.R. Fan, T.Y. Sanchez, A. Choi, H-K. Turner, G.W.	IEEE J. Quantum Electron., Vol. 31, No. 9, September 1995, pp. 1603–1605
7208	Picosecond-Accuracy All-Optical Bit Phase Sensing Using a Nonlinear Optical Loop Mirror	Hall, K.L. Rauschenbach, K.A. Swanson, E.A. Chinn, S.R. Raybon, G.	IEEE Photonics Technol. Lett., Vol. 7, No. 8, August 1995, pp. 935–937
7209	Error-Rate Performance of Optical Amplifiers with Fabry-Perot Filters	Chinn, S.R.	Electron. Lett., Vol. 31, No. 9, 27 April 1995, pp. 756–757
7210	InAsSb/InAlAsSb Strained Quantum-Well Diode Lasers Emitting at 3.9 $\mu$ m	Choi, H-K. Turner, G.W.	Appl. Phys. Lett., Vol. 67, No. 3, 17 July 1995, pp. 332–334
7211	20-GHz Optical Storage Loop/Laser Using Amplitude Modulation, Filtering, and Artificial Fast Saturable Absorption	Moores, J.D. Hall, K.L. LePage, S.M. Rauschenbach, K.A. Wong, W.S. Haus, H.A. Ippen, E.P.	IEEE Photonics Technol. Lett., Vol. 7, No. 9, September 1995, pp. 1096–1098
7222	Tertiarybutylaluminum as an Organometallic Source for Epitaxial Growth of AlGaSb	Wang, C.A. Finn, M.C. Salim, S. Jensen, K.F. Jones, A.C.	Appl. Phys. Lett., Vol. 67, No. 10, 4 September 1995, pp. 1384–1386
7230	A Lightweight Fast Hopping Synthesizer for EHF Satellite Applications	Materna, D.M.	IEEE MILCOM '95, Vol. 2, 6–8 November 1995, pp. 752–759

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7231	All-Optical Storage of a 1.25 kb Packet at 10 Gb/s	Hall, K.L. Moores, J.D. Rauschenbach, K.A. Wong, W.S. Ippen, E.P. Haus, H.A.	IEEE Photonics Technol. Lett., Vol. 7, No. 9, September 1995, pp. 1093–1095
7234	Tunable Single-Frequency Yb:YAG Laser with 1-W Output Power Using Twisted-Mode Technique	Fan, T.Y. Ochoa, J.R.	IEEE Photonics Technol. Lett., Vol. 7, No. 10, October 1995, pp. 1137–1138
7237	An 800-MHz Monolithic GaAs HBT Serrodyne Modulator	Kushner, L.J. Van Andrews, G. White, W.A. Delaney, J.B. Vernon, M.A. Harris, M.P. Whitmire, D.A.	IEEE J. Solid-State Circuits, Vol. 30, No. 10, October 1995, pp. 1041–1050
7238	Precision Runway Monitor	Shank, E.M. Hollister, K.M.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 329–354
7240	Observation of a Nanocrystalline-to-Amorphous Phase Transition in Luminescent Porous Silicon	Kunz, R.R. Nitishin, P.M. Clark, H.R. Rothschild, M. Ahern, B.	Appl. Phys. Lett., Vol. 67, No. 12, 18 September 1995, pp. 1766–1768
7245	The ASR-9 Processor Augmentation Card (9-PAC)	Pieronek, J.V.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 355–378
7277	Evaluation of Runway-Assignment and Aircraft-Sequencing Algorithms in Terminal Area Automation	Vandevenne, H.F. Lippert, M.A.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 215–238
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7280	Performance of the Runway-Status Light System at Logan Airport	Wilhelmsen, H. Kastner, M.P. Morin, T.J. Sturdy, J.L.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 187–214
7285	Air Traffic Control Development at Lincoln Laboratory	Fielding, J.C.	Linc. Lab. J., Vol. 7, No. 2, Fall 1994, pp. 147–148
7293	Fourier-Space Image Restoration	Parenti, R.R.	Linc. Lab. J., Vol. 8, No. 1, Spring/Summer 1995, pp. 29–48

## MEETING SPEECHES

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10151A	Time-Scale Modification with Temporal Envelope Invariance	Quatieri, T.F. Dunn, R.B. Hanna, T.E.	Proc. IEEE Workshop on Applications of Signal Processing to Audio and Acoustics, 17–20 October 1993, pp. 127–130
10159	The Application of Subband Coding to Improve Quality and Robustness of the Sinusoidal Transform Coder	McAulay, R.J. Quatieri, T.F.	ICASSP'93, Proc. IEEE Int. Conf. on Acoustics, Speech and Signal Processing, Vol. 2, Speech Processing, 27–30 April 1993, pp. 439–442
10411	The Calibration and Characterization of IRAS Metric Resident Space Object Detections	Lane, M.T. Baldassini, J.F. Gaposchkin, E.M.	AAS/AIAA Astrodynamics Specialist Conf., 14–17 August 1995, 14 pages
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